ENVIRONMENTAL Fact Sheet

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

29 Hazen Drive, Concord, New Hampshire 03301 • (603) 271-3503 • www.des.nh.gov

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Layman's Guide for Measuring a Lake's Trophic State

Trophic State

The trophic state of a lake is a general concept with no precise definition and no well defined units of measure. In general it refers to the biological production, both plant and animal life, that occurs in a lake. The level of production that occurs is determined by several factors, but primarily by the phosphorus supply to the lake and by the volume and residence time of the water in the lake.

Many different indicators have been used by scientists to describe trophic state. A few of the more commonly used indicators are presented below, along with ranges of values that depict the three trophic categories for New Hampshire lakes. A given lake may fall into more than one trophic category, depending on the indicator used.

Trophic Status of NewHampshire

	Number of Lakes	Area of Lakes
oligotrophic	31%	70%
mesotrophic	45%	24%
eutrophic	24%	6%

Trophic Categories

Oligotrophic:
larger, deeper lakes with clear water, rocky or sandy shorelines, low phosphorus enrichment, limited rooted plant growth, low algal growth and adequate dissolved oxygen throughout.
Mesotrophic:
an intermediate category with characteristics between the other two groups.
Eutrophic:
smaller, shallower ponds with mucky bottoms, extensive rooted plant growth and depleted dissolved oxygen in the bottom waters; often tea-colored and .sometimes murky from planktonic algal growth.

Trophic Indicators

1. **Phosphorus**

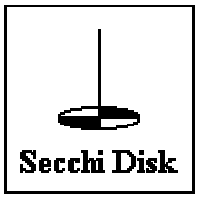
   In New Hampshire lakes, phosphorus is the plant nutrient that controls aquatic plant growth. Phosphorus values in NH lakes range from less than .001 mg/L to .121 mg/L, with a median value of .011 mg/L.

Phosphorus (mg/L)	Trophic Category
≤ .010	oligotrophic
.010 - .020	mesotrophic
≥ .020	eutrophic

2. **Water Clarity**

The water clarity or Secchi disk transparency is a measure of the depth one can see into a lake. It ranges from less than a foot to over 40 feet in NH lakes with a median value of 11 feet.

Water Clarity (ft.)	Trophic Category
≥ 13	oligotrophic
6 - 13	mesotrophic
≤ 6	eutrophic



3. **Chlorophyll**

Chlorophyll is a measure of the amount of planktonic algae in the water. Chlorophyll values in NH lakes range from less than one to over 100 ug/L with a median value of 4.4 ug/L.

Chlorophyll (ug/L)	Trophic Category
≤4	oligotrophic
4 - 15	mesotrophic
≥15	eutrophic

4. **Rooted Plant Growth**

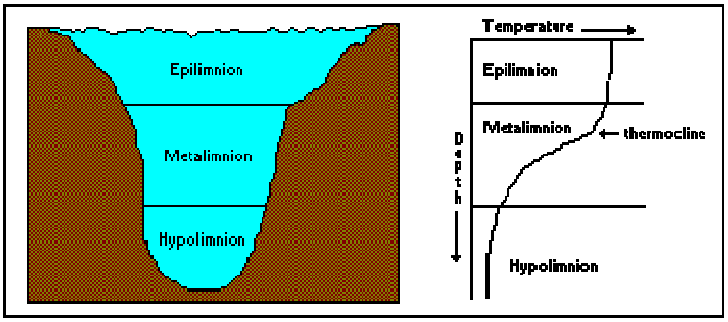
In general, rooted plant growth is more reflective of substrate type and water depth than it is of in-lake nutrient levels. Most rooted plants obtain most of their nutrient requirements from the sediment and not directly from the water. However, to the extent that shallow, weedy, mucky-bottomed lakes are considered eutrophic, rooted plant growth can be used as a trophic indicator. A subjective evaluation of the amount of plant growth is used for the evaluation below.

Plant Growth	Trophic Category
sparse to scattered plant growth around the shore with perhaps a few small patches	oligotrophic
plants present along most of the shoreline with some thick patches	mesotrophic
floating or emergent plants covering over 1/3 the surface area and/or submerged plants over most of the visible bottom	eutrophic

5. **Dissolved Oxygen**

This criterion can be used only for lakes that are deep enough to develop a cold bottom layer of water (hypolimnion) during the summer. The extent of dissolved oxygen depletion in the hypolimnion is a measure of decomposing organic matter in the bottom waters and in the sediments, and represents an indirect measure of the biological production in the lake.

Dissolved Oxygen (mg/L)	Trophic Category
≥ throughout the lake	oligotrophic
< 1 in less than half of the hypolimnion volume	mesotrophic
< 1 in more than half of the hypolimnion volume	eutrophic



Thermal Stratification of Deep N.H. Lakes in Summer

Changing Trophic State

Lakes generally change trophic state very slowly, gradually becoming more eutrophic over time, where time is measured in thousands of years. This process is called natural eutrophication. Often the process is greatly accelerated due to human activity (called cultural eutrophication). Cultural eutrophication can be controlled by managing human activity within the watershed and on the lake. Watershed controls that reduce phosphorus runoff and erosion into a lake will help protect the lake and slow its movement toward a more eutrophic state. See fact sheet WSPCD-1989-12 for lake protection tips.